| REVISIONS | | | |
|---|---|---|---|
| **SYMBOL** | **DESCRIPTION** | **DATE** | **APPROVAL** |
| – | Original Release | 4/29/05 | ZNG |
| A | Completely redrawn to add Unit 7 code specifics, to clarify standard tolerance limits, and to add mounting configurations 716 through 718 per RN A-146. | 2/21/07 | ZNG |
| B | Revised per RN A-169.<br>Original Signatures on File | 12/15/10 | JS |

**SHEET REVISION STATUS**

| SH | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| REV | B | B | B | B | B | B | B | B | B | B | | | | | | | | | | |
| SH | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| REV | | | | | | | | | | | | | | | | | | | | |

| | | |
|---|---|---|
| **ORIGINATOR:**<br>**T. Perry/QSS Group Inc.** **TJ Perry/QSS** | **DATE**<br>**4/28/05** | **FSC: 5930** |
| **APPROVED:**<br>**TJ Perry/Commodity Specialist** | **4/28/05** | Switch, Thermostatic, Bimetallic, SPST, Corrosion Resistant Steel, Hermetic, Detail Specification for |
| **CODE 562 APPROVAL:**<br>**M.A. Proctor/Code 562/GSFC** **Vinod Patel for M.A. Proctor** | **4/28/05** | |
| **CODE 562 SUPERVISORY APPROVAL:**<br>**D.D. Lakins/Code 562 GSFC** **Darryl D. Lakins** | **4/28/05** | |
| **ADDITIONAL APPROVAL:** | | **S-311-641/03** |

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**
**GODDARD SPACE FLIGHT CENTER**
**GREENBELT, MARYLAND 20771**

**CAGE CODE: 25306**

## GSFC DETAIL SPECIFICATION

**SWITCH, THERMOSTATIC, BIMETALLIC, SINGLE POLE, SINGLE THROW (SPST), CORROSION RESISTANT STEEL, HERMETICALLY SEALED**

The requirements for procuring the thermostatic switches described herein shall consist of this specification and the current revision of GSFC S-311-641.

**PART NUMBER EXAMPLE:**

| G311P641/03 | 710 | S | 040 | A | 065 | A | / | A | 1 | Z |
|---|---|---|---|---|---|---|---|---|---|---|
| (A) | (B) | (C) | (D) | (E) | (F) | (G) | | (H) | (I) | (J) |

(A) GSFC PREFIX

(B) MOUNTING CONFIGURATION
- 701 = Bare Module (See Figure 1)
- 702 = .164-32 Stud Mount (See Figure 2)
- 703 = .190-32 Stud Mount (See Figure 3)
- 704 = .138-32 Stud Mount (See Figure 4)
- 705 = Narrow Slot-Slot Flange (See Figure 5)
- 706 = Hole-Slot Flange (See Figure 6)
- 707 = Tube Mount Adapter (See Figure 7)
- 708 = Bare Module with Strain Relief (See Figure 8)
- 709 = Bare Module with Lead Wires (See Figure 9)
- 710 = .250 Dia. Tube Mount Adapter with Lead Wires (See Figure 10)
- 711 = .164-32 Stud Mount with Leas Wires (See Figure 11)
- 712 = Hole-Slot Flange with Lead Wires (See Figure 12)
- 713 = .375 Dia. Tube Mount Adapter with Lead Wires (See Figure 13)
- 714 = Tube Mount Adapter with Lead Wires (See Figure 14)
- 715 = Hole-Slot Flange, Long (See Figure 15)
- 716 = Hole-Slot Flange, Bat Wing (See Figure 16)
- 717 = Tube Mount Adapter, Anodized Aluminum (See Figure 17)
- 718 = Tube Mount Adapter, Anodized Aluminum, Screw Clamp (See Figure 18)

(C) S = Space Rated Thermal Switch

(D) Lower Operating Setpoint in °F

(E) A = Open on Rising Temperature
B = Close on Rising Temperature

(F) Upper Operating Setpoint in °F

(G) Special Temperature Feature Code *

(H)(I)(J) Special Physical Feature Code (See Figure section as applicable, Unit 7 code). Consult factory for special configurations not shown.

* See Table 1 for non-standard operating temperatures, differential and tolerances. The setpoint tolerances may also be specified by adding a suffix to the ordering code:

/X/Y/Z where X = Closing setpoint tolerance
Y = Opening setpoint tolerance
Z = Minimum differential between opening and closing setpoints

Example: /3/2/7 represents: ±3°F on closing, ±2°F on opening and 7°F minimum differential.

**REQUIREMENTS**

**Dimensions, configuration and weight: see Figures 1 and on.**

**Switching action: Single Pole, Single Throw (SPST)**

**Storage temperature range: −184ºF to +350ºF (−120ºC to +177ºC)**

**Operating temperature range: −120ºF to +300ºF (−84.4ºC to +148.9ºC)**

**Contact rating: resistive load, 5.0 amperes at 28 VDC, 100,000 cycles**
**3.5 amperes at 42 VDC, 10,000 cycles**
**1.0 ampere at 120 VDC, 250,000 cycles**
**1.0 ampere at 30 VDC, 1,000,000 cycles**
**1.0 milliampere at 1 mV, 100,000 cycles**

**Contact resistance (per MIL−STD−202, Method 307):**
**Inconel electrical terminations: 0.025 ohms maximum**
**High Purity Nickel electrical terminations: 0.010 ohms maximum**

**DWV: 1250 VAC, rms, 60 Hz for 1 minute, terminals to case, per MIL−STD−202, Method 301**

**Vibration (Random): 20−2000 Hz, 22.7 grms, 24 minutes in most critical axis (unmonitored)**

**Shock: Tested to 4000g's, ½ sine, ½ millisecond.**

**Hermeticity: 1 X $10^{-8}$ atm cc/sec. maximum, per MIL−STD−202, Method 112, Condition C**

**CRBI (Contact Resistance Burn−In): 1000 cycles, 0.050 ohms maximum [Inconel terminations] or 0.020 ohms maximum [High Purity Nickel terminations], each closure with missed cycle detection**

**Cleaning: 100% tested for cleanliness using micro−particle analysis (<1 mil particle limit)**

**DPA (Destructive Physical Analysis): Customer option. Performed per MIL−STD−1580, Rev. B**

**Acceptance Testing (100% of parts): Vibration, PIND, 1000 cycle CRBI, Temperature Setpoint, Controlled Creepage (600 VDC, 4.5 ms arc duration)**

**Lot Acceptance testing: RGA (1000 ppm moisture maximum) and Group B**

**Standard Tolerance Limits***

| Specified Temperature Setpoint Range | Temperature Tolerance |
|---|---|
| −120 to 0ºF (−84.4 to −17.8ºC) | ±6 °F (±3.3 °C) |
| +1 to +250ºF (−17.2 to +121.1ºC) | ±5 °F (±2.8 °C) |
| +251 to +300ºF (121.7to +148.9ºC) | ±7 °F (±3.9 °C) |

*** 7 degree F (3.9 degree C) minimum differential between close and open setpoints. When tolerance overlap occurs, the minimum differential takes precedence.**

**Table 1 Special Temperature Feature Code**

| | |
|---|---|
| **A** | **Setpoint tolerances are min-max. Differential shall be 5°F minimum.** |
| **B** | **Opening setpoint is min or max.** |
| **C** | **Closing setpoint is min or max.** |
| **D** | **Opening setpoint is ±5° with 7° to 18° differential. Closing setpoint given is min or max. possible.** |
| **E** | **Closing setpoint is ±5° with 7° to 18° differential. Opening setpoint given is min or max. possible.** |
| **F** | **Closing setpoint is ±4°F with 11 to 19°F differential. Opening setpoint is min or max. possible.** |
| **G** | **Opening and closing setpoints are ±3°F** |
| **H** | **Opening and closing setpoints are ±4°F** |
| **J** | **Opening and closing setpoints are ±5°F** |
| **K** | **Closing setpoint is ±2°F. Opening setpoint is min or max.** |
| **M** | **Differential shall be 5°F min.** |
| **N** | **Closing setpoint is ±3°F. Opening setpoint given is min or max possible.** |
| **P** | **Closing setpoint is ±4°F. Opening setpoint given is min or max possible.** |
| **R** | **Setpoint tolerances are Min-Max. Differential shall be 10°F Min.** |
| **S** | **Opening and closing setpoints are ±6°F. Differential shall be 10°F Min.** |
| **T** | **Closing setpoint is ±5° with 7° to 13° differential. Opening setpoint given is min or max possible.** |
| **U** | **Setpoint tolerances are min-max. Specify minimum differential (example: U/7).** |
| **V** | **Opening setpoint is min or max. Specify closing tolerance and minimum differential (example: V/5/7).** |
| **W** | **Closing setpoint is min or max. Specify opening tolerance and minimum differential (example: W/5/7).** |

**Figure 1:**
**701 = Bare Module**

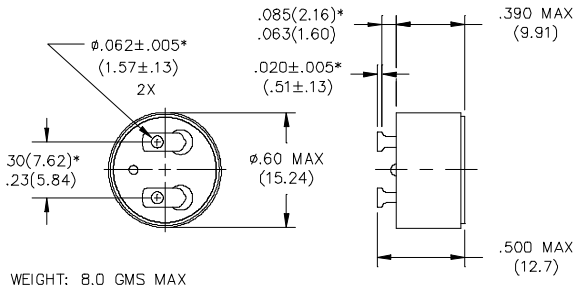



**Figure 2:**
**702 = .164-32 Stud Mount**

| UNIT 7H | DIM "A" |
|---|---|
| A | .500 |
| B | .438 |
| C | .375 |
| D | .312 |
| E | .250 |
| F | .187 |

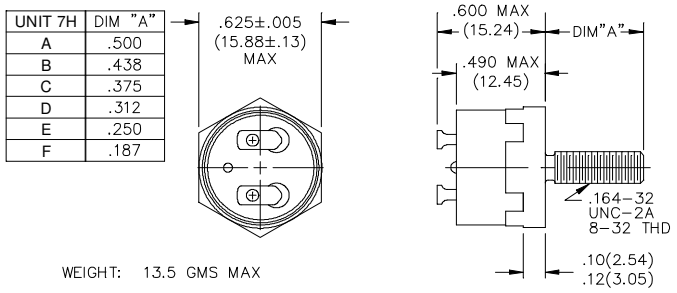


**Figure 3:**
**703 = .190-32 Stud Mount**

| UNIT 7H | DIM "A" |
|---|---|
| A | .500 |
| B | .438 |
| C | .375 |
| D | .312 |
| E | .250 |
| F | .187 |

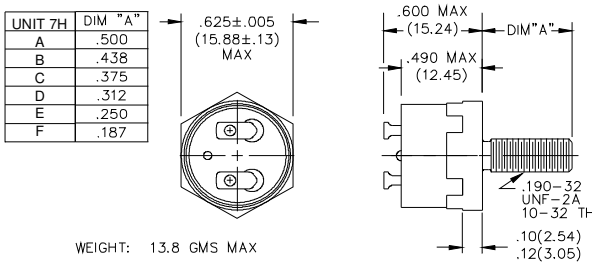



**Figure 4:**
**704 = .138-32 Stud Mount**

| UNIT 7H | DIM "A" |
|---|---|
| A | .187 |
| B | .250 |

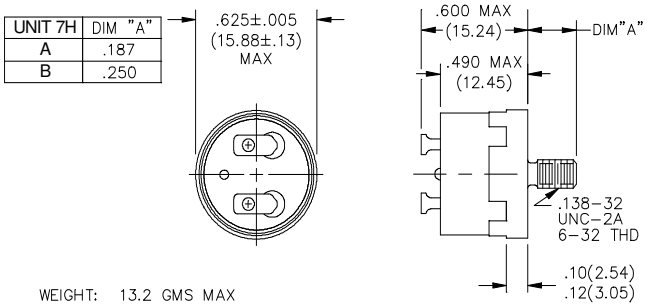



**Figure 5:**
**705 = Narrow Slot-Slot Flange**

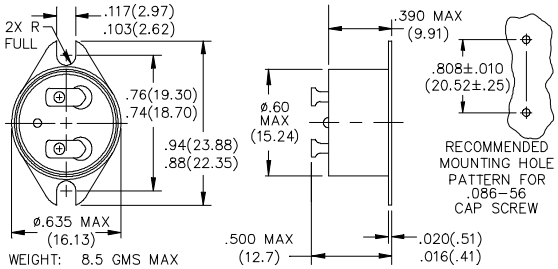



**Figure 6:**
**706 = Hole-Slot Flange**

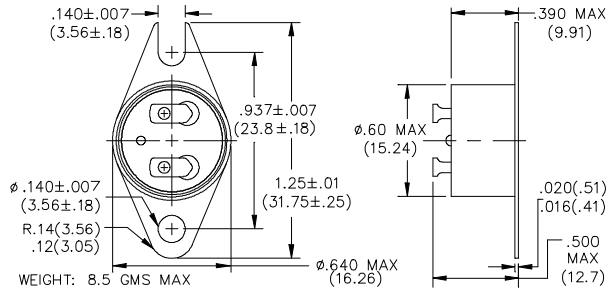



**Figure 7:**
**707 = Tube Mount Adapter**

UNIT 7 (H)(I)(J)

| ORDERING CODE (UNIT 7A) | TUBE DIAMETER | DIMENSION "A" ±.01 |
|---|---|---|
| A | .250 +.030/-.000 (6.35 +.760/-.000) | .29 (7.37) |
| B | .375 +.030/-.000 (9.52 +.760/-.000) | .43 (10.92) |
| C | 3.73 +.030/-.000 (94.74 +.760/-.000) | .61 (15.49) |
| D | 2.88 +.030/-.000 (73.15 +.760/-.000) | .61 (15.49) |
| ORDERING CODE (UNIT 7B) | TUBE BRACKET MOUNTING ANGLE (±10°) | |
| 1 | 0° (Lead Wires Parallel to Tube Direction) | |
| 2 | 45° | |
| 3 | 90° (Lead Wires Perpendicular to Tube Direction) | |
| 4 | 135° | |
| ORDERING CODE (UNIT 7C) | WIRE AND OVERMOLD | |
| NONE | NO WIRE AND OVERMOLD | |
| A | M22759/43-22-9 | |
| B | M22759/43-20-9 | |
| C | M22759/43-16-9 | |

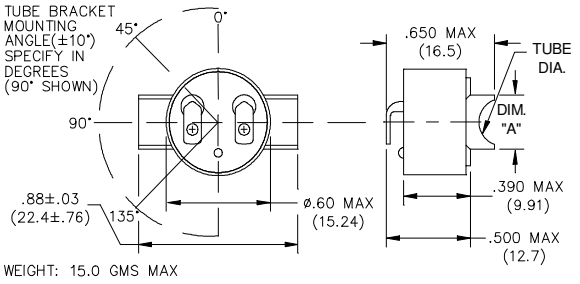


**Figure 8:**
**708 = Bare Module with Strain Relief**

| UNIT 7H | |
|---|---|
| A | M22759/43-22-9 |
| B | M22759/43-20-9 |

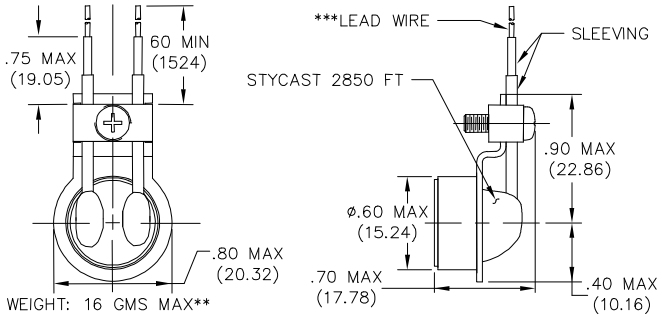



**Figure 9:**
**709 = Bare Module with Lead Wires**

| UNIT 7H | |
|---|---|
| A | M22759/43-22-9 |
| B | M22759/43-20-9 |

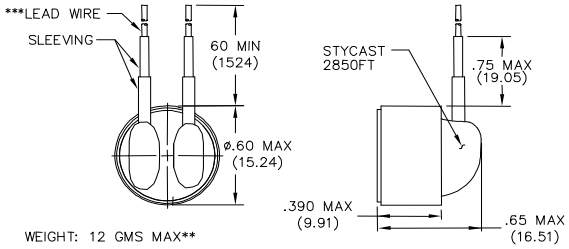



**Figure 10:**
**710 = .250 Dia. Tube Mount Adapter with Lead Wires**
UNIT 7 (H)(I)(J)

| ORDERING CODE (UNIT 7A) | LEAD WIRE MIL-SPEC |
|---|---|
| A | M22759/43-22-9 |
| B | M22759/43-20-9 |
| ORDERING CODE (UNIT 7B) | TUBING ADAPTER MOUNTING ANGLE (±10°) |
| 1 | 0° (Lead Wires Parallel to Tube Direction) |
| 2 | 45° |
| 3 | 90° (Lead Wires Perpendicular to Tube Direction) |
| 4 | 135° |
| ORDERING CODE (UNIT 7C) | OTHER OPTIONS |
| Z | LESS STRAP AND SHIPPING TUBE |
| Y | LESS STRAP AND SHIPPING TUBE. WITH WIRE TIE FEATURE ON TUBING ADAPTER (SEE P/N 652-4197-050) |
| X | TUBING ADAPTER DIAMETER IS .287 +.030/-.000 |

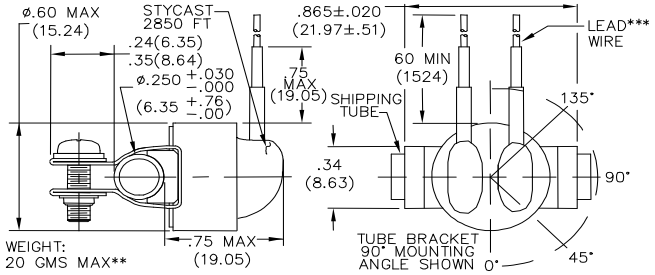



**Figure 11:**
**711 = .164-32 Stud Mount with Lead Wires**
UNIT 7 (H)(I)(J)

| ORDERING CODE (UNIT 7A) | LEAD WIRE MIL-SPEC |
|---|---|
| A | M22759/43-22-9 |
| B | M22759/43-20-9 |
| ORDERING CODE (UNIT 7B) | STUD LENGTH ±.020 (.51) |
| 1 | .500 (12.70) |
| 2 | .438 (11.13) |
| 3 | .375 (9.53) |
| 4 | .312 (7.93) |
| 5 | .250 (6.35) |
| 6 | .187 (4.75) |

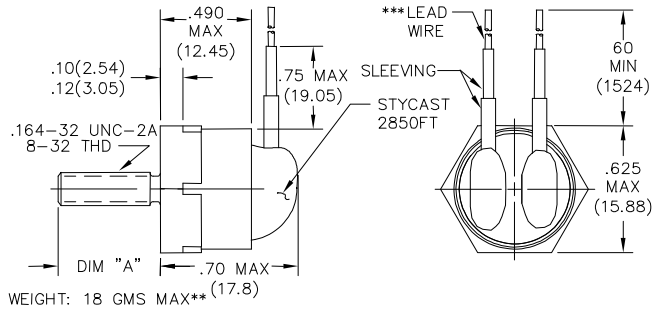


**Figure 12:**
**712 = Hole-Slot Flange with Lead Wires**

| UNIT 7H | |
|---|---|
| A | M22759/43-22-9 |
| B | M22759/43-20-9 |

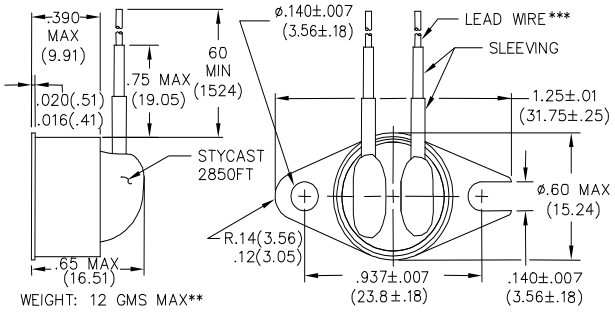



**Figure 13:**
**713 = .375 Dia. Tube Mount Adapter with Lead Wires**

UNIT 7 (H)(I)(J)

| ORDERING CODE (UNIT 7A) | LEAD WIRE MIL-SPEC |
|---|---|
| A | M22759/43-22-9 |
| B | M22759/43-20-9 |
| ORDERING CODE (UNIT 7B) | TUBING ADAPTER MOUNTING ANGLE (±10°) |
| 1 | 0° (Lead Wires Parallel to Tube Direction) |
| 2 | 45° |
| 3 | 90° (Lead Wires Perpendicular to Tube Direction) |
| 4 | 135° |
| ORDERING CODE (UNIT 7C) | OTHER OPTIONS |
| Z | LESS STRAP AND SHIPPING TUBE |
| Y | LESS STRAP AND SHIPPING TUBE. WITH WIRE TIE FEATURE ON TUBING ADAPTER (SEE P/N 652-4197-051) |

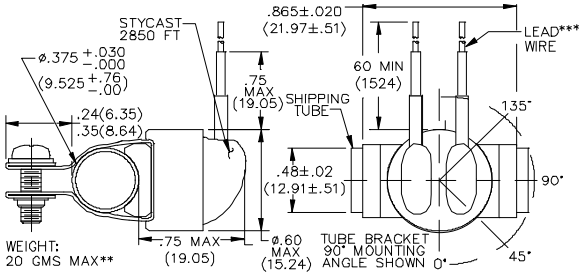
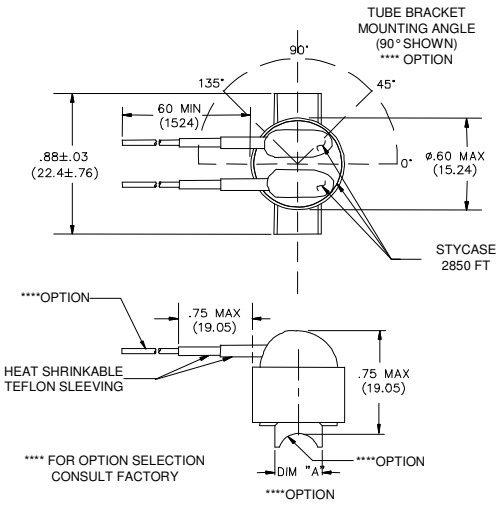



**Figure 14:714 = Tube Mount Adapter with Lead Wires**

UNIT 7 (H)(I)(J)

| ORDERING CODE (UNIT 7A) | TUBE DIAMETER | DIMENSION "A" ±.01 |
|---|---|---|
| A | .250 +.030/-.000 (6.35 +.760/-.000) | .29 (7.37) |
| B | .375 +.030/-.000 (9.52 +.760/-.000) | .43 (10.92) |
| C | 3.73 +.030/-.000 (94.74 +.760/-.000) | .61 (15.49) |
| D | 5.16 +.030/-.000 (131.06 +.760/-.000) | .61 (15.49) |
| ORDERING CODE (UNIT 7B) | TUBING ADAPTER MOUNTING ANGLE (±10°) | |
| 1 | 0° (Lead Wires Parallel to Tube Direction) | |
| 2 | 45° | |
| 3 | 90° (Lead Wires Perpendicular to Tube Direction) | |
| 4 | 135° | |
| ORDERING CODE (UNIT 7C) | LEAD WIRE MIL-SPEC | |
| W1 | M22759/43-22-9 | |
| W2 | M22759/43-20-9 | |




Weight will vary by configuration

**Figure 15:**
**715 = Hole-Slot Flange, Long**

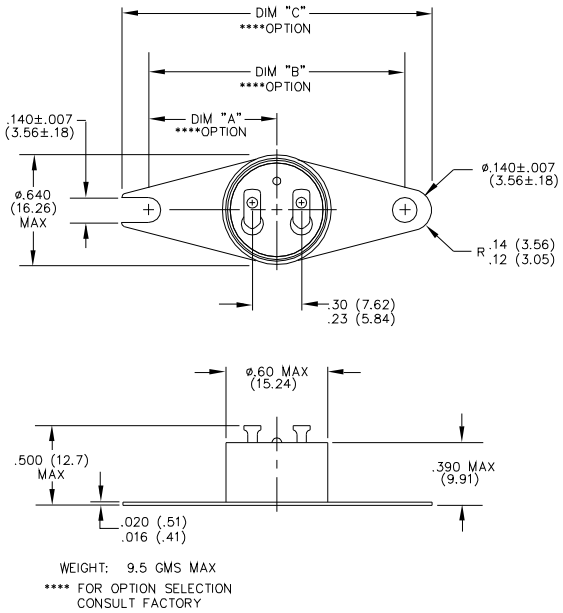



**Figure 16:**
**716 = Hole-Slot Flange,**
**Bat Wing**

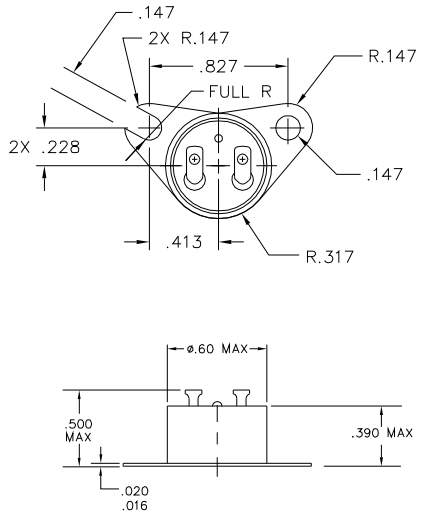
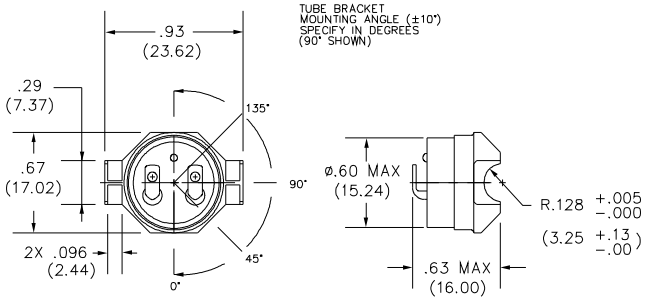


**Figure 17:**
**717 = Tube Mount Adapter, Aluminum, Tie Strap or Epoxy Mount**

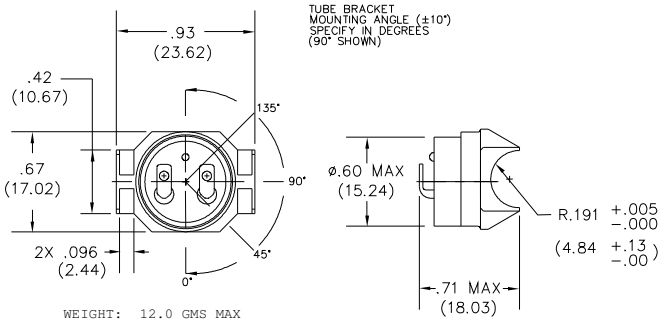
UNIT 7 (H)(I)(J)

| ORDERING CODE (UNIT 7A) | TUBE MOUNT DIAMETER (FOR REFERENCE ONLY) |
|---|---|
| A | .256 +.010/-.000 (6.50 +.25/-.00) |
| B | .381 +.010/-.000 (9.68 +.25/-.00) |
| C | .506 +.020/-.000 (12.85 +.51/-.00) |
| D | .756 +.020/-.000 (19.20 +.51/-.00) |
| E | .881 + .020/-.000 (22.38 + .51/-.00) |
| ORDERING CODE (UNIT 7B) | TUBING ADAPTER MOUNTING ANGLE (±10°) |
| 1 | 0° (Terminal Orientation Parallel to Tube Direction) |
| 2 | 45° |
| 3 | 90° (Terminal Orientation Perpendicular to Tube Direction) |
| 4 | 135° |



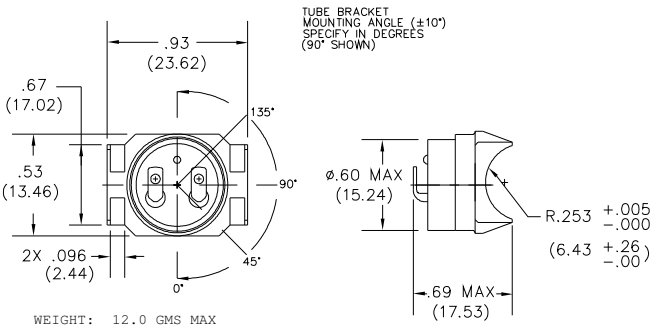

****Option 1

**¼ " Diameter Tube Mount**



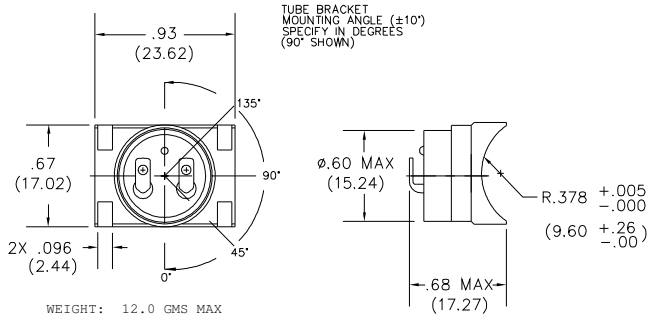

****Option 2

$^{3}/_{8}$" Diameter Tube Mount




****Option 3

½" Diameter Tube Mount




****Option 4

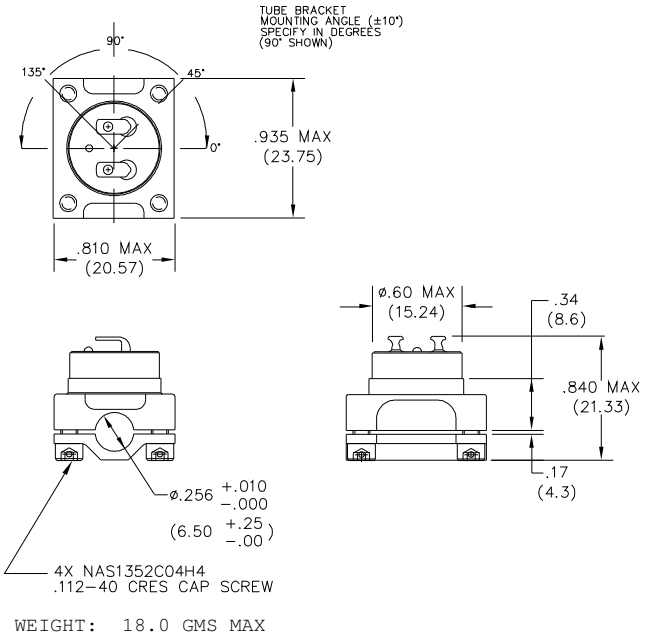
**$^{3}/_{4}$" Diameter Tube Mount**

****** FOR OPTION SELECTION CONSULT FACTORY**

**Note: Aluminum Adapter is 6061-T6, Anodized per MIL-A-8625, Type II, Class 2, Black. Recommended Tie Strap is Thomas&Betts TYZ523M.**

**Figure 18:**
**718 = Tube Mount Adapter, ¼" Diameter, Aluminum, Screw Mount**
UNIT 7 (H)(I)(J)

| ORDERING CODE (UNIT 7A) | TUBE MOUNT DIAMETER (FOR REFERENCE ONLY) |
|---|---|
| A | .256 +.010/-.000 (6.50 +.25/-.00) |
| B | TBD |
| C | TBD |
| D | TBD |
| ORDERING CODE (UNIT 7B) | TUBING ADAPTER MOUNTING ANGLE (±10°) |
| 1 | 0° (Terminal Orientation Parallel to Tube Direction) |
| 2 | 45° |
| 3 | 90° (Terminal Orientation Perpendicular to Tube Direction) |
| 4 | 135° |




WEIGHT: 18.0 GMS MAX

* Typical Dimension for all configurations.
** "WEIGHT" does not include weight of lead wires.
*** Wire (where applicable) MIL-W-22759/43

**Note: Aluminum Adapter is 6061-T6, Anodized per MIL-A-8625, Type II, Class 2, Black.**

**Approved source(s):**

| Manufacturer | Cage Code | Vendor Similar Part Number |
|---|---|---|
| Honeywell DSES, Redmond, WA. | 0FYP0 | 700 Series |